Changkat Changi Secondary School

UNIT 6

Energy, Work and Power

Name: _____

Class: _____

Date: _____

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NOTES 6.1

LESSON OBJECTIVES

At the end of the lesson, you will be able to:

- Define energy and identify different forms of Energy
- State the S.I. unit for energy
- Understand and apply formula for potential energy
- Understand and apply formula for kinetic energy

What is energy?

In earlier units, you would notice that there are different types of forces acting on objects. To exert these forces, different amount of energy is required. With energy, we can then do work.

In physics, energy is defined as the _____ of an object to do _____.

Types of energy

There are different forms of energy, namely: kinetic energy, potential energy, etc.

S.I. unit of energy is _____.

What is kinetic energy ?

Kinetic energy ( ) is the energy a _____ object possess. Any moving object has kinetic energy. Kinetic energy can be used to do work, for example, kinetic energy generated by wind and waves in wind mills or wind farms.

To calculate k.e. of an object, we can use the following formula

Example

Calculate the kinetic energy of a car of mass 1000 kg moving with a velocity of 7 m/s.

What is Potential energy?

Energy that is _____ in a object is known as Potential Energy. There are a few types of potential energy, namely :

i. Chemical Potential Energy that comes from the food we eat , solar energy, batteries etc.

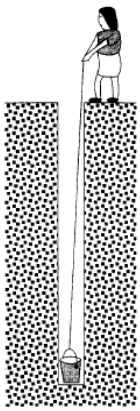
ii. Elastic Potential energy that comes from a spring or rubber band when _____ or _____.

iii. Gravitational Potential Energy ( ) refers to the potential energy an object gains when it is raised to a certain _____, example a ball gains g.p.e as it is thrown upwards above ground.

To calculate g.p.e of an object, we can use the following formula:

Example.

Calculate the potential energy possessed by a pail, full of water, at the mouth of a well if it has a mass of 200 g and is pulled up 10m from the bottom of the well carrying water of mass 2 kg.



NOTES 6.2

LESSON OBJECTIVES

At the end of the lesson, you will be able to:

- Understand that energy can be changed from one form to another
- State Principle of conservation of energy
- Apply Principle of conservation of energy to daily observations

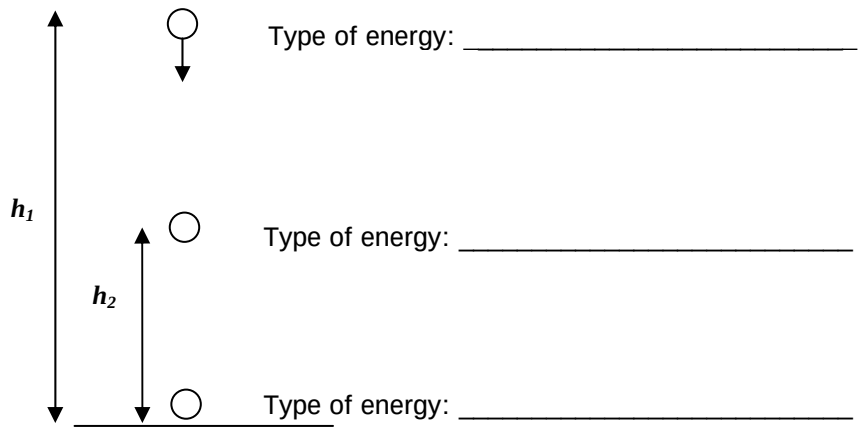
Conversion of energy

Observe the following and describe what happen to the energy used in each case.

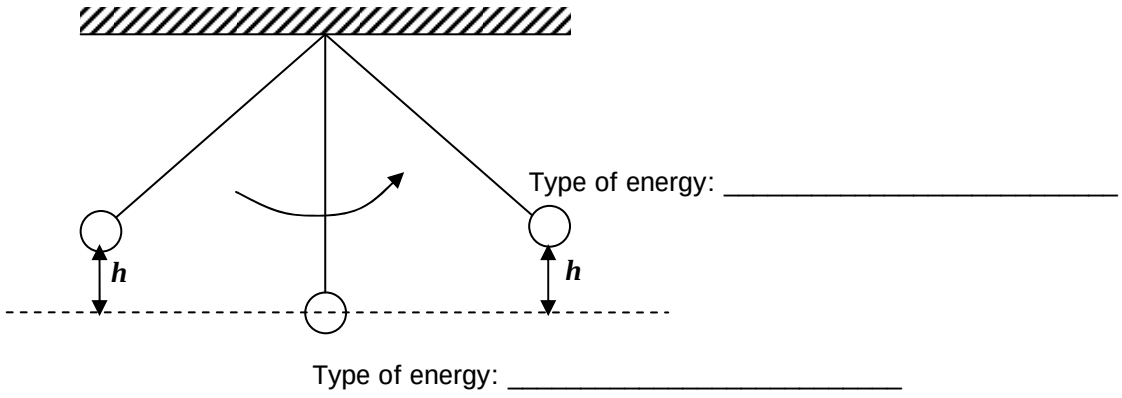
Principle of conservation of energy

Identifying energy of objects

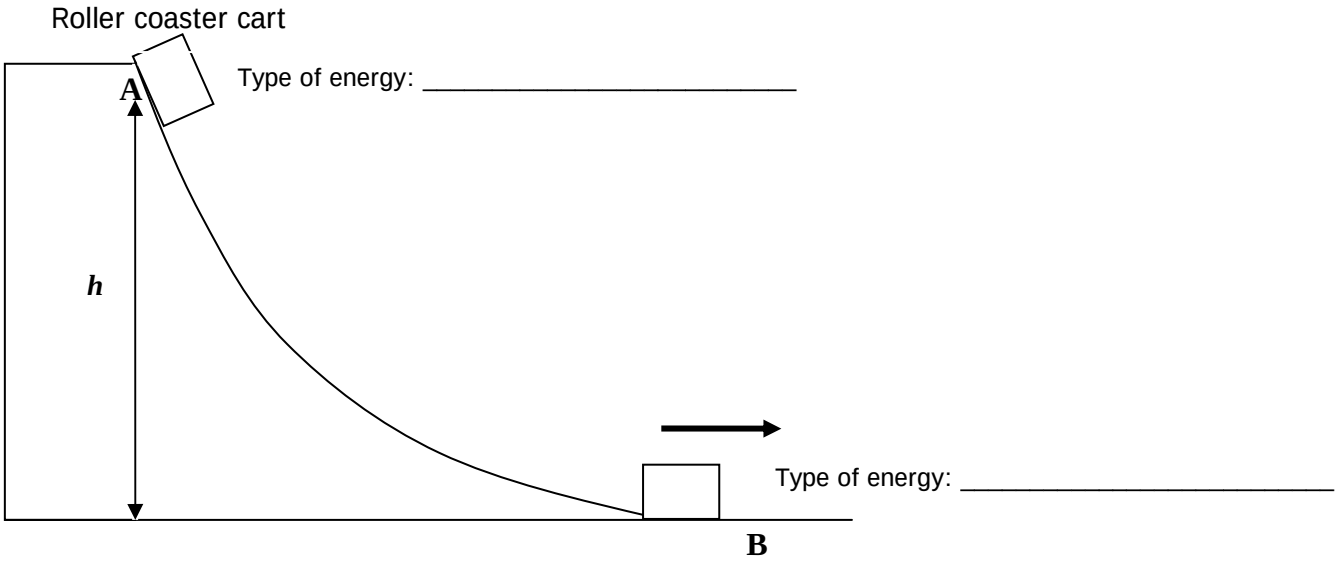
Case 1 – Falling object



Case 2-- Pendulum



Case 3 –Roller coaster



For each case, energy _____is equal to the energy _____at different stages.

Example

An object of mass 3 kg falls from a height of 10 m above the ground.

(a) What is the gain in kinetic energy just before the object strikes the ground?

(b) Calculate the speed of the object just before it strikes the ground.

NOTES 6.3

LESSON OBJECTIVES

At the end of the lesson, you will be able to:

- Work done is the product of a force and displacement in the direction of the force.
- Define power and state SI unit of power
- Apply formulas of power and work done to different applications.

What is work done?

As we learnt earlier, energy is required for all objects to do work. As we do work , this energy is converted to other forms of energy.

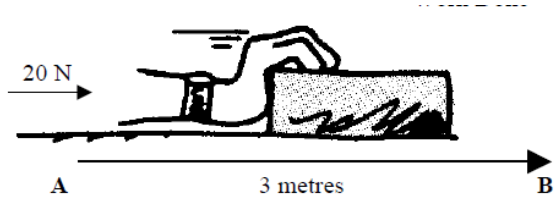
Amount of work is done depends on two factors, force and the distance moved by the object in the direction of force.

We can write in formula:

S.I. unit of work is _____( ). One joule is equivalent to _____.

Examples

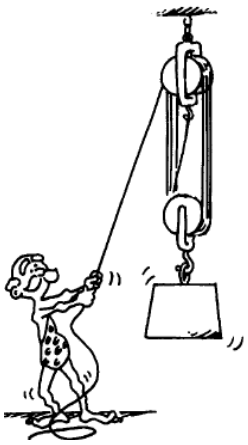
a. A force is applied to a box and it moves from A to B in the direction shown.
Calculate the work done.



b. A box of 90 kg is raised vertically by man to a height of 3 m.

(i) What is the minimum force required to lift the box?

(ii) What is the work done by the person to raise the box?



What is power?

In everyday language, we usually associate power with force and authority. In physics, power is defined as _____.

In formula, we write:

S.I. unit for power is _____ ( ). One watt is also equivalent to one _____.

Examples

Calculate the power of the actions in the table below.

Actions	Force	Distance	Work Done	Time	Power
Opening a door	10 N	0.2 m	2 J	10s	2 W
Lifting a bag	15 N	1.0 m	15 J	10s	
Throwing a ball	10 N	5.0 m		5s	
Climbing stairs	500 N	4.0 m		30s	

What can you do to increase the power of those actions stated above?

_____

_____